
**The Massachusetts
Growth and Nutrition Program
Summary Report
FY 2003**



Bureau of Family and Community Health

Massachusetts Department of Public Health

February 2004

The Massachusetts Growth and Nutrition Program Summary Report FY 2003

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EXECUTIVE SUMMARY

Growth delay (GD), also known as Failure to Thrive (FTT), is a serious condition of undernutrition that affects up to five percent of children admitted to pediatric hospitals nationwide. In 2003, the Massachusetts Growth and Nutrition Program (GN Program) provided care to close to 900 infants and children. The overall goal of the program is to improve the growth and developmental outcome of children with GD. Services are provided by a multidisciplinary team consisting of a physician, nurse practitioner, nutritionist, social worker, case manager, and/or psychologist specifically trained in the evaluation and treatment of GD.

This report is based on data collected from nine GN sites that participated in the Massachusetts GN Program from July 2002 through June 2003. During this period, 285 infants and children were enrolled following a screening evaluation. Most of these new cases (61.2%) were referred by a primary care physician. Other common referral sources included community health centers (27.2%), outpatient subspecialties (6.4%) and community-based programs such as WIC and Early Intervention (2.8%).

Demographic characteristics

The majority of children (67.4%) were enrolled before 24 months of age. Over one-fifth (22.3%) of children were between 24 and 36 months, and 10.3% were enrolled after 36 months of age. Forty-four percent (44.4%) of the children were White non-Hispanic and the remaining were Black non-Hispanic (23.7%), Hispanic (10.7%), Asian (8.5%) and other ethnicities (12.6%). Although the programs treated children from all income categories, a greater proportion of families enrolled in the program (57.3%) were below 200% of the federal poverty guidelines. An additional 28.6% were between 200% and 299% of the federal poverty threshold.

Nutritional status at enrollment

Of the new cases, 94.6% of the pre-term and 74.3% of full-term babies were underweight¹. Forty-eight percent and 22.6% had low height-for-age among pre-term and full-term babies, respectively. Sixty percent and 46.4% had low weight-for-height among the pre-term and full-term babies, respectively. Twenty-seven percent of the new cases had low birthweights (LBW²), and 20.4% were born prematurely (<37 weeks gestation).

Improvement in nutritional status between intake and discharge

Eighty and 85.2% of pre-term and full-term babies respectively, who completed a course of treatment in the GN programs showed overall improvement in weight-for-age, height-for-age, or weight-for-height by the time of discharge.

¹ Underweight = weight-for-age < 3rd percentile, low height-for-age = height-for-age < 3rd percentile, and low weight-for-height = weight-for-height < 3rd percentile, compared to the 2000 CDC Growth Chart reference (Kuczmarski et al., 2000).

² Low birthweight = birthweight < 2500 g.

Recommendations

- Continue outreach efforts and improve referrals to community-based agencies which provide additional services to GN Program clients.
- Continue to highlight the growth and nutritional status of premature/LBW babies separately from full-term, normal weight babies since premature children exhibit differences in nutritional status and growth performance compared to full-term babies.
- Add supplemental questions, such as those included in the Current Population Survey Food Security Supplement questionnaire, about food availability during the preceding 12 months. This would allow for comparisons to other statewide and national reports regarding food sufficiency and security.
- Consider collecting incremental data to allow for calculation of growth velocity and timing of improvement in growth. This recommendation could be accomplished best by capturing encounter-level data through a computerized data collection system. It is recommended that a needs assessment regarding system development and site-level computer capacity be initiated. Computerized data collection and transmission also would improve data quality and timeliness.

INTRODUCTION

Purpose of this report

This report provides summary information on demographic characteristics, nutritional status, and participation in community services of children at the time of their enrollment in the Massachusetts GN Program during state fiscal year (FY) 2003. In addition, the report looks at improvement in nutritional status between the time of enrollment and discharge from the GN Program, length of stay in the GN Program, causes of growth delay (GD), and reasons for discharge among children diagnosed with GD who completed a course of treatment.

The intended audience for this report includes state GN Program staff, GN Program vendor sites, state public health officials, the Massachusetts State Legislature, and other parties interested in maternal and child health.

Massachusetts Growth and Nutrition Program

The overall goal of the GN Program is to improve the growth and developmental outcome of children with GD. The GN Program, including a statewide network of seven GN sites (initially called Failure to Thrive Programs), was established by the Massachusetts Department of Public Health (MDPH) in July 1984, after finding that undernutrition and growth delays were present among low income children (Guyer, 1983). In FY 2003 the GN sites served almost 900 infants and children throughout all regions of the Commonwealth (see Appendix 1 for a list of participating GN sites). Since the program's inception, participating sites have been located at Baystate Medical Center, Boston Medical Center, Boston Children's Hospital, New England Medical Center and the University of Massachusetts Medical Center at Worcester, with satellite sites in Brockton and Fall River. In 1996, the programs expanded to include satellite sites at Saints Memorial Hospital in Lowell and Greater Lawrence Family Health Center in Lawrence, offering services to communities with limited access to medical care due to transportation and cultural barriers.

Within MDPH, services to children with GD and their families are part of a continuum of family-centered, interdisciplinary and community-based services for children. The GN Program operates under the auspices of the Division of Nutrition Services within the Bureau of Family and Community Health (BFCH). Technical assistance and guidance related to community-based outreach and service coordination is provided to GN sites by the GN Program Director. Analytic and evaluation services are coordinated through the Applied Statistics, Evaluation, and Technical Services Division in the BFCH.

Children with GD come to a participating GN site for evaluation and treatment through referrals from primary care providers, hospitals, and community-based agencies including nutrition programs such as the Massachusetts Special Supplemental Program for Women, Infants and Children (WIC) program and Head Start. Children referred to the GN Programs receive an initial assessment which includes anthropometric measurements (weight and height), physical examination, and medical and nutritional histories. The child's developmental level, parent-child interaction, and the family's social situation also are evaluated. While all team members are involved in the initial assessment and the development of a comprehensive care plan for each child and family, the case manager on the team assists the family with coordination of services. Conferences before and after each clinic session enable the team to review cases and

to develop treatment and follow-up plans. In addition to the GN team, primary care providers are kept apprised of treatment plans to comply with managed care systems in which primary care providers are the medical home for services. Community-based program providers also may participate in treatment and planning as appropriate.

Treatment includes clinic visits, home visits, and telephone contacts with the family. The frequency of follow-up care depends on the severity of the GD as well as etiology. If a child seen in the GN Program is hospitalized for nutritional or medical treatment, the GN team provides consultation to the inpatient staff to ensure continuity of care. After the child is discharged from the hospital, GN site staff resume follow-up care.

Home or daycare visits may be used to further evaluate feeding behavior and parent-child interaction as well as to reinforce clinical treatment plans. Such visits may be conducted by a GN staff member or coordinated by a community-based professional from an organization such as Visiting Nurse Association or the Early Intervention Program. In addition to home visits, care plans are designed for each child enrolled in the GN Program. These plans are treatment and service coordination outlines developed within a family-centered model of care and include inputs from the team as well as community providers to ensure continuity of care. Families have the opportunity to discuss all aspects of care to ensure that language and cultural needs are addressed.

Growth Delay

Growth delay (GD) is the term used to describe severely malnourished infants and young children ages three years and younger who fail to gain weight or height over time as expected relative to established growth standards based on age and sex (Bithoney et al., 1992; Kessler, 1999; Steward et al., 2003). The term normally is not used when a child's weight decreases due to a short illness and recovers immediately after the illness. The term "failure to thrive (FTT)" previously has been used to describe children with growth problems; however, throughout this report the term "growth delay" will be used as it is considered to be less pejorative. FTT has negative connotations with regard to the complexities of growth problems and can be a source of considerable stress for mothers and families (Kessler, 1999). Families' distrust and suspicion of the term FTT may discourage them from successfully carrying out therapeutic intervention.

Child undernutrition is associated with increased morbidity and mortality, decreased activity levels, decreased immunologic resistance, long term impairments in cognitive development and academic performance, and complicated behavioral and social problems (Bithoney et al., 1992; Kessler, 1999). Recently, low birthweight and poor childhood nutritional status have been associated with an increased risk of adult diseases including heart disease, obesity, and high blood pressure (Goldberg and Prentice, 1994; Godfrey and Barker, 2000). Children with GD constitute a sizable portion of pediatric ambulatory care visits and have been identified in 1% to 5% of children under two years of age who are admitted to hospitals (Kessler, 1999). GD may be found in up to 10% of low income children (Miller et al., 2002).

There are three main causes of GD, namely organic, non-organic, and mixed causes. Organic GD is defined as growth deficiency which results from a specific medical illness and is associated with a major organ or system dysfunction (Bithoney et al., 1992; Kessler, 1999). Organic correlates such as gastrointestinal, central nervous system, or cardiac problems may create defects in food assimilation, excessive loss of ingested calories, or increased energy requirements, all of which contribute to insufficient growth.

Organic factors include developmental delay, recurrent otitis media, respiratory infections, poor birth outcomes, gastrointestinal disorders, lead poisoning, and oral motor dysfunction. In non-organic GD, where growth problems are due to economically, socially, or emotionally induced undernutrition, the primary reason for the child's GD is insufficient caloric consumption. Non-organic factors include individual temperament, parental misperceptions, poor feeding interactions, non-feeding interactions, and family stressors. Mixed causes of GD result from a combination of both organic and non-organic causes. Due to its multidimensional nature, team intervention is the most appropriate approach for treating GD, regardless of its etiology. Effective treatment of GD must include family-centered, multidisciplinary evaluation and treatment that address medical, nutritional, developmental, and psychosocial factors associated with GD.

Child undernutrition continues to be a major public health problem in the United States as well as in Massachusetts, particularly among children in economically disadvantaged households. The GN Program, in conjunction with other community-based health and nutrition programs, plays an important role in improving childhood nutritional status, and thereby may prevent hospital admissions due to nutritional causes. In addition to improving early childhood nutrition, these programs also may be indirectly improving some children's cognitive abilities and helping children grow into healthy and successful adults.

TECHNICAL FOREWORD

Data Collection and Preparation

Data for program participants were collected at two timepoints: at the time of initial assessment ("intake"), and upon completion of a course of treatment ("discharge"). Some children were referred for assessment, but were determined not to be eligible for program services. These subjects are considered to have been screened but not enrolled. Due to variability in the duration of enrollment for treatment, some subjects are described in the report as being "continuing" during FY 2003. This indicates that during FY 2003, the child was neither newly enrolled, nor discharged from the program. No other data are collected during program enrollment except at the time of intake and discharge.

Data were collected on demographic characteristics of the family, medical history, hematologic indicators, anthropometric measurements, and community-based program participation. Anthropometric measurements (height and weight) were obtained by staff trained according to clinic protocols. Data were collected at the initial assessment using the "Growth and Nutrition Clinic Intake Form" and at discharge using the "Growth and Nutrition Clinic Discharge/Change of Status/Transfer Form" (see Appendix 3 for copies of forms) by staff at each of the GN Program sites.

The total number of responses varied from question to question, with some people answering some questions and not others, resulting in different total number of cases responding to each question. Consequently, for each table in the report, the total n (denominator; "Total N") is presented for each indicator, as well as the number of cases affected (numerator, "Cases N") and the associated percentage of total.

Data entry was completed by IT Services at MDPH. Analyses were conducted by the Senior Nutrition Research Analyst in the Applied Statistics, Evaluation, and Technical Services Division of the Bureau of Family and Community Health, with input from the GN Program Director in the Division of Nutrition Services. Data were cleaned, analyzed, and maintained using SPSS v.10.

Data Analyses

Subjects

Data were analyzed for 285 children who were newly enrolled in the GN Program during FY 2003. Data were analyzed on 137 cases who were discharged during FY 2003.

Growth and nutritional status assessment

Nutritional status was assessed for each child by comparing his or her weight and height to age- and sex-matched peers represented in the national CDC growth reference (Kuczmarski et al., 2000; Steward et al., 2003) using a computerized program provided by CDC in SAS. Z-scores and percentiles for weight-for-age, height-for-age, and weight-for-height were generated for each child from both the intake and discharge anthropometric data.

Percentiles are the commonly used clinical indicators to assess the size and growth patterns of individual children. They rank the position of an individual by indicating what percent of the reference population the individual would equal or exceed. They range from 0-100, with the 50th percentile representing the median of the reference population. For instance, on the weight-for-age growth charts, a child who is on the 25th percentile, weighs the same or more than 25 percent of the reference population of children of the same age, and sex (Kuczmarski et al., 2002). Because reference populations are considered representative of healthy children in the U.S., these charts are used for evaluating the size of individual children and groups of children in this country. Ninety percent of the population is expected to have weight and height values between the 5th and 95th percentiles. The remaining 10% of the population is expected to be evenly divided between below the 5th percentile and above the 95th percentile.

Z-scores, also called standard deviation (SD) scores, describe how far the child is from the median relative to age- and sex-matched peers (Gibson, 1990). The z-score is the deviation of the value for an individual from the mean value of the reference population divided by the SD for the reference population. It expresses an individual's weight and height measurements in standard deviation units. Z-scores are also used to measure the change in growth rate. When z-scores for an individual's measures are compared over time, a negative change in z-score indicates a slowing of the growth rate in comparison to the reference population. Z-scores and percentiles are directly related and can be converted in either direction. Z-scores are preferred in certain research and clinical settings because the mean and SD can be calculated for a group of z-scores.

For analytic purposes, receipt of both an intake and a discharge data collection form by MDPH defined completion of treatment. Analyses for improvement in nutritional status between intake and discharge were conducted on 112 cases who completed a course of treatment in FY 2003. The following cases were not included in the analysis of cases completing a course of treatment: cases lost to follow-up, those who refused care, those who moved, and those with other characteristics such as missing intake or discharge anthropometry. To compute improvement in growth and nutritional status, weight-for-age (WA), height-for-age (HA), and weight-for-height (WH) z-scores at intake were subtracted from WA, HA, and WH z-scores at discharge. A positive difference in z-scores between enrollment and discharge in any single z-score or a combination of z-scores was regarded as an improvement in growth and nutritional status.

Birthweight and gestational age

Birthweights less than 2,500 grams may reflect premature delivery and/or intrauterine growth retardation (IUGR) (Kuczmarski et al., 2002). Infants weighing less than 2500 grams at birth are categorized as low birthweight (LBW). Premature infants are defined as those born at less than 37 weeks of gestation. There is no clear agreement as to

which reference to use when analyzing very low birth weight (VLBW) and premature babies. Special growth charts based on gestational age rather than chronological age have been developed for VLBW and premature infants; however, these charts have been unreliable because they represent a compilation of a relatively small number of infants or they are based on old data (Bassali et al., 2002; Kuczmarski et al., 2002). The new CDC Growth Charts can be used as growth reference for VLBW babies provided the results are adjusted for gestational age (Kuczmarski et al., 2002). In the current report, the new CDC Growth Chart reference was used for all analyses. Results are presented by gestational age (less than 37 weeks vs. gestational age 37 weeks or higher) to account for LBW due to prematurity.

Table 1: Birthweight categories

Birthweight Cutoffs	Birthweight Status
< 1,500 g	Very Low Birthweight (VLBW)
1,500 – 2,500 g	Moderately Low Birthweight (MLBW)
2,500 – 4,000 g	Normal Birthweight (NBW)
> 4,000 g	High Birthweight (HBW)
Source: CDC, 2000	

Hematologic status

Results from laboratory tests (hematocrit, hemoglobin, and lead concentrations) were obtained either from the child's primary care physician, the Massachusetts WIC Program, or received directly from the hospital laboratory following blood sample acquisition, and were recorded on the intake and discharge data forms as appropriate. Indicators of iron status were assessed by comparing hemoglobin and hematocrit concentrations to cutoffs established by CDC (CDC, 1998). Lead status also was assessed.

Iron deficiency anemia is the most common known nutritional deficiency, particularly among young children and women. The tests commonly used to screen for iron deficiency are hemoglobin and hematocrit. These measures reflect the amount of functional iron in the body. Among infants (0-12 months) and preschool children (1-5 years), iron deficiency anemia has been reported to be associated with developmental delays and behavioral disturbances such as decreased motor activity, social interaction, attention deficit, and increased susceptibility to infection (CDC, 1998). Developmental delays associated with iron deficiency anemia may continue beyond school age (past 5 years or age) if the iron deficiency is not corrected (CDC, 1998). The anemia reference values for children are derived from the third National Health and Nutrition Examination Survey, 1988-1994 (NHANES III) (CDC, 1998). See Table 2 for hemoglobin and hematocrit cutoffs. Normal hematological values change as children grow older, so it is necessary to use age-specific criteria for identifying children with anemia.

Table 2: Cutoff values for anemia among infants and children

Hematological Cutoffs		
Age (months)	Hemoglobin (g/dl)	Hematocrit (%)
6.0 – 11.9*	<11.0	<32.9
12.0 – 23.9	<11.0	<32.9
24.0 – 59.9	<11.1	<33.0
60.0 – 95.9	<11.5	<34.5
96.0 – 143.9	<11.9	<35.4

Source: CDC, 1998

*The values listed for infants aged 12 – 23.9 months are also used for infants aged 6 – 11.9 months because NHANES III does not have data to determine maximum hemoglobin concentration and hematocrit values for anemia among infants.

Lead poisoning

Lead is an environmental toxicant that may affect the nervous, hematopoietic, endocrine, renal and reproductive systems and continues to be a common environmental threat among children despite the recent decline in the prevalence of elevated blood lead levels (BLLs) (Pirkle et al., 1994). Elevated lead levels are defined as 10 µg/dL or higher (American Academy of Pediatrics, 1998). The risk of lead exposure is disproportionately high among children (1 – 5 years old) who are poor, Black non-Hispanic, Mexican American, living in large metropolitan areas, or living in older housing (CDC, 1997). The most common source of lead exposure among children is lead-based paint that has deteriorated into paint chips and dust (CDC, 1997). The toxicity of lead is based on the dose, the duration of exposure, and the developmental nutritional vulnerability of the child (American Academy of Pediatrics, 1998). For instance, dietary deficiencies of calcium, iron, and zinc enhance the detrimental effects of lead on cognitive and behavioral development (Goyer, 1995). In addition, iron deficiency contributes to lead poisoning in children by increasing the gastrointestinal tract's ability to absorb lead and other heavy metals (Goyer, 1995). The CDC has established guidelines to assess toxic blood lead levels and describe recommended interventions to lower lead levels in the blood (American Academy of Pediatrics, 1998). The recommendations vary depending on severity of exposure. The recommended follow-up services for elevated BLL (10 µg/dL or greater) vary depending on the range of the exposure. For instance, the recommended action for BLL 10 – 14 µg/dL is different from that of 15 – 19 µg/dL (American Academy of Pediatrics, 1998).

Household income and poverty status³

A poverty status variable was created by combining household income and household size and subsequently adjusting it according to federal poverty guidelines. Family income was originally collected as a categorical variable. To define income in relation to the federal poverty level, the midpoint of the income range in each category was used. For instance, a response coded within the range of \$5,000 to \$9,999 would be converted to percentage poverty on the basis of \$7,500. The 2003 poverty guidelines were applied to FY 2003 data. One consideration is that guidelines are based on the calendar year while the family income of GN patients is available only on a fiscal year basis.

³ See Appendix 2 for federal poverty guidelines.

1. Results

PART 1: Program Participation

Table 3: Number of participating cases in FY 2003 according to category of participation
Massachusetts Growth and Nutrition Program, FY 2003

Fiscal Year	Screened ¹	New Intakes		Continuing Cases		Total Served
		Enrolled ²	Discharged Same FY ³	Continuing ⁴	Discharged During FY ⁵	
2003	48	242	43	491	75	899

Source: Massachusetts Department of Public Health, 2003

¹ Screened but not enrolled for service because no growth failure was found

² New cases enrolled but not discharged during FY 2003

³ New cases enrolled and discharged during FY 2003

⁴ Continuing cases enrolled prior to fiscal year but not discharged during current FY 2003

⁵ Continuing cases enrolled prior to fiscal year and discharged during current FY 2003

- The Massachusetts GN Program provided care to nearly 900 children in FY 2003. These included newly enrolled cases as well as cases that were continuing from previous years.
- There were 285 newly enrolled cases in FY 2003 of which 43 were discharged during the same year.

PART 2: Characteristics of Subjects at Enrollment

Table 4: Demographic characteristics of subjects at intake
Massachusetts Growth and Nutrition Program, FY 2003

	Total N	Cases N	Percent
Age Categories	282		
0 – 11 months		55	19.5
12 – 23 months		135	47.9
24 – 36 months		63	22.3
>36 months		29	10.3
Sex	283		
Male		149	52.7
Female		134	47.3
Race/Ethnicity	270		
White non-Hispanic		120	44.4
Black non-Hispanic		64	23.7
Hispanic		29	10.7
Asian/SE Asian		23	8.5
Other/Unknown*		34	12.6
Mother's Education	260		
<High School		25	9.6
Some High School		37	14.2
High School Graduate or GED		77	29.6
Some College		51	19.6
College Graduate or Higher		70	26.9
Father's Education	234		
<High School		11	4.7
Some High School		28	12.0
High School Graduate or GED		79	33.8
Some College		46	19.7
College Graduate or Higher		70	29.9
Percent of Poverty**	206		
< 100%		77	37.4
100 – 199%		41	19.9
200 – 299%		59	28.6
≥ 300%		29	14.1

Source: Massachusetts Department of Public Health, 2003

* Children who do not identify themselves with the four major groups above, for example, Native Americans or persons of mixed heritage.

** See Appendix 2 for an explanation of how percent of poverty is computed.

Table 4 presents demographic characteristics of children enrolled in the Massachusetts GN Program during FY 03.

- Of the new cases, 19.5% were enrolled in the GN Program at less than 12 months of age, over half (47.9%) were enrolled between 12 and 23 months of age, and 22.3% were enrolled between 24 and 36 months. Only 10.3% were enrolled at ages greater than 36 months.
- The majority of children (44.4%) were White non-Hispanic, 23.7% were Black non-Hispanic, 10.7% were Hispanic, and 8.5% were Asian. The remainder (12.6%) were Native Americans, South Asians, and other persons who did not specify their race.
- The majority of biological fathers (49.6%) or mothers (46.5%) of the new cases had completed some college, or had completed college or higher education. Fourteen percent (14.2%) of the mothers and 12.0% of the fathers had attended some high school. Thirty percent (29.6%) of the mothers and 33.8% of the fathers had completed high school education. Only 9.6% and 4.7% of the mothers and fathers, respectively, had less than a high school education.
- Although the GN sites treated children from all income categories, the largest proportion (57.3%) of families enrolled in the program were below 200% of the federal poverty threshold, and 28.6% were between 200% and 299% of the federal poverty threshold.

Table 5: Household composition

Massachusetts Growth and Nutrition Program, FY 2003

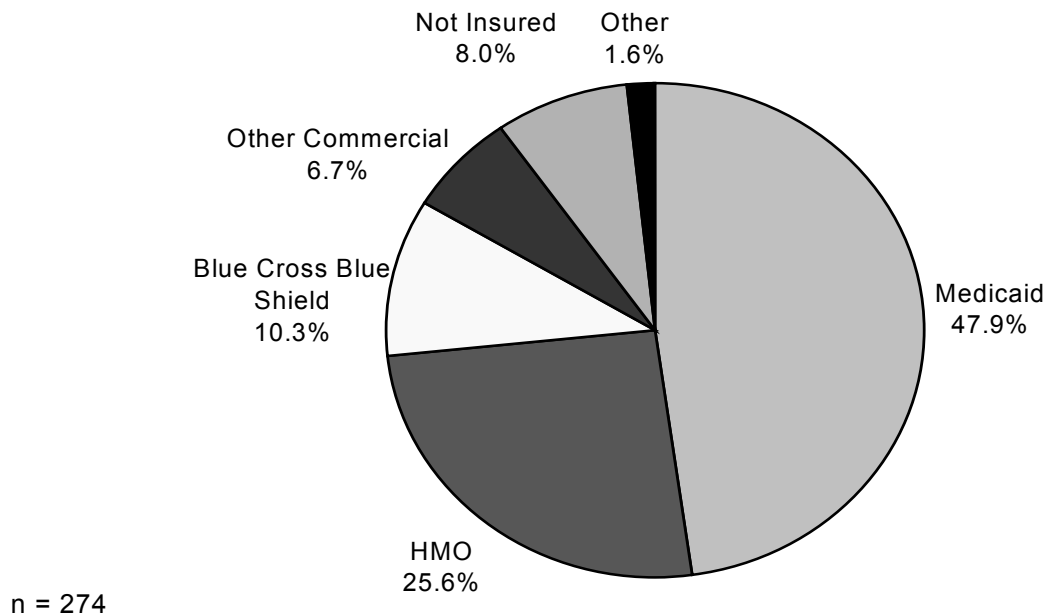
	Total N	Cases N	Percent
Number of Individuals ≥ 18 y	278		
0 – 1		48	17.3
2 – 3		200	71.9
> 3		30	10.8
Number of Individuals < 18 y including Index Child*	278		
		205	73.7
1 – 2		62	22.3
3 – 4		11	4.0
> 4			
Number of Smokers in the Household	269		
0		188	69.9
1		62	23.0
2		17	6.3
> 2		2	0.7
Child Lives with:	281		
Biological mother only		83	29.3
Biological father only		5	1.8
Both parents		180	64.1
Foster/step parents/other adults		13	4.6

Source: Massachusetts Department of Public Health, 2003

* Index child refers to child enrolled in the GN Program.

- Seventeen percent (17.3%) of participants lived in households with one adult aged 18 years or older. The majority of participants (71.9%) lived in households with 2 to 3 individuals aged 18 years and older. Eleven percent (10.8%) lived in households with more than three persons older than 18 years.
- Almost three-quarters (73.7%) of the new cases lived in households with 1 or 2 people less than 18 years of age (including the child). Twenty-two percent (22.3%) lived in households with 3 to 4 individuals less than 18 years of age (including the child) and 4% of new cases lived in households with more than 4 people less than 18 years of age (including the index child).
- Most of the new cases (69.9%) came from non-cigarette smoking homes and 30.1% of the households had cigarette smokers living in them.
- Sixty-four percent (64.1%) of new cases lived with both biological parents. Thirty percent (29.5%) lived with their biological mother only and less than one percent (1.8%) reported living with their biological fathers only. Five percent (4.6%) of new cases were either in foster care or living with a step-parent or another adult.

Figure 1: Type of health care coverage at intake
Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

- Almost half (47.9%) of children enrolled in the GN Program reported that their health insurance coverage was the State Medicaid Program or MassHealth; followed by Health Maintenance Organization (HMO; 25.6%), Blue Cross Blue Shield (10.3%) and other commercial insurance organization (6.7%). Almost two percent (1.6%) of children reported being insured by other insurance.
- Eight percent (8.0) of the new cases reported that they were not covered by any health insurance.

Table 6: Sources of referral to Massachusetts Growth and Nutrition Program
Massachusetts Growth and Nutrition Program, FY 2003

	Total N	Cases N	Percent
Hospital-based Primary Care	283	48	17.0
Private Primary Care Provider	283	125	44.2
Community Health Center	283	77	27.2
Outpatient Subspecialty	283	18	6.4
Community Agencies*	283	8	2.8
Hospital Inpatient	283	3	1.1
Other**	283	12	4.2

Source: Massachusetts Department of Public Health, 2003

* "Community Agencies" include WIC, Early Intervention, VNA, and MA Department of Social Services.

** "Other" includes referrals from emergency rooms, other GN Programs, sources other than those listed on the data collection questionnaire, and self/family referrals.

- Among all children seen at the GN sites, 61.2% were referred by a Primary Care Physician (PCP) which includes hospital-based and private primary care, 27.2% by a community health center (CHC), 6.4% by outpatient subspecialty, and 2.8% by Community Agencies. Although PCP and CHC are listed separately on the form, it is possible that a proportion of the PCPs listed as referral sources were located at CHCs.
- The remaining children were hospital inpatients (1.1%) and subjects referred by other mechanisms (4.2%).

Table 7: Participation in community-based services at intake
Massachusetts Growth and Nutrition Program, FY 2003

Service	Total N	Cases N	Percent
WIC	279	148	53.0
Early Intervention	280	85	30.4
TAFDC	277	72	26.0
Food Stamps	280	72	25.7
SSI	278	31	11.2
DSS (All services)	280	28	10.0

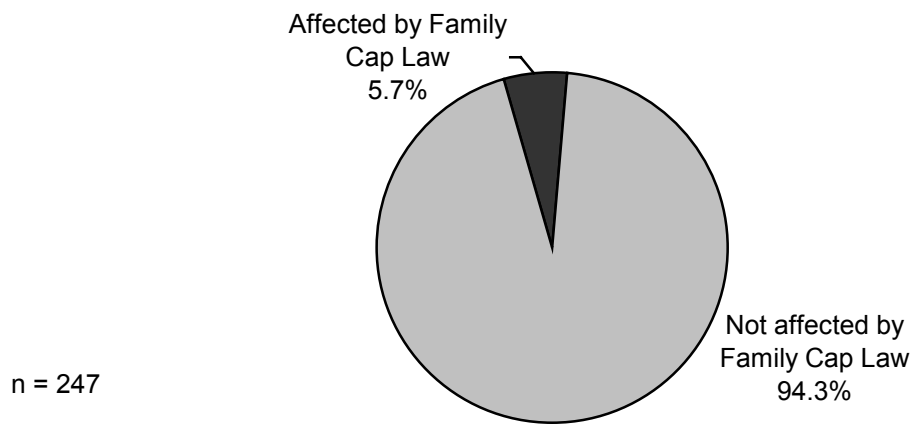
Source: Massachusetts Department of Public Health, 2003

- At enrollment, 53.0% of cases were reported to have been participating in the Massachusetts WIC Program⁴; 30.4% in Early Intervention; 26.8% in Transitional Aid to Families with Dependent Children (TAFDC); 25.7% in Food Stamps; 11.2% in Supplemental Security Income (SSI); and 10.0% in Massachusetts Department of Social Services (DSS) programs.

⁴ Special Supplemental Nutrition Program for Women, Infants and Children.

Figure 2: Percentage of children who were affected by TAFDC family cap legislation

Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

The Transitional Aid to Families with Dependent Children (TAFDC) is a cash benefit program which resulted from the November 1995 Welfare Reform Law and was permitted under the new Federal Welfare Reform program.

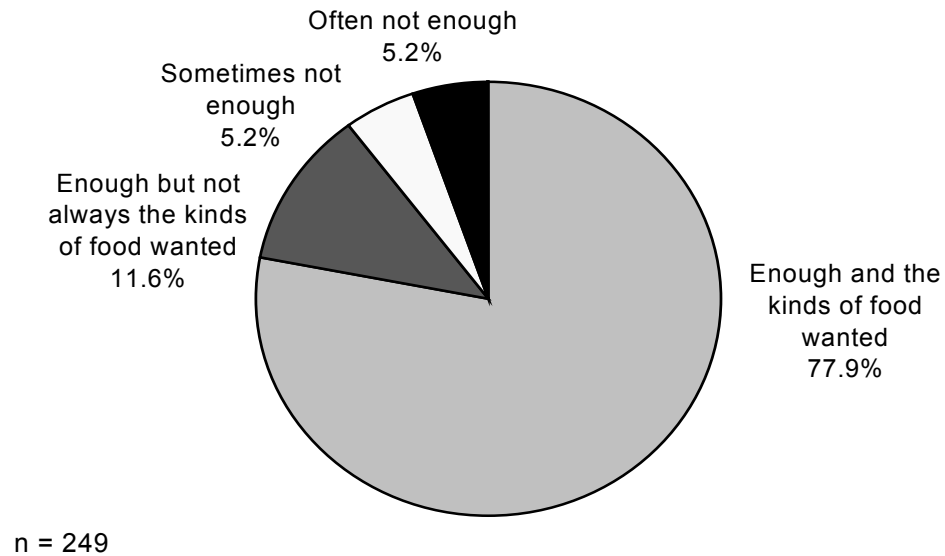
A provision of this change in legislation was called the "Family Cap rule," which meant that children born to people on TAFDC more than 10 months after their application to TAFDC would be denied an incremental grant increase of approximately \$90 per month unless they qualified as an exception to the rule (Welfare Report, 1996; Massachusetts Law Reform Institute, 1995). Before the Family Cap rule, the amount of TAFDC a family received was based on the size of the household, regardless of when the children in the household were born.

The Family Cap Rule applies only to cash benefits, although excluded children still may qualify for Medicaid and Food Stamps.

- When asked if the child was a TAFDC family cap child, only 5.7% of the total respondents enrolled in the GN Program reported that their child was affected by TAFDC Family Cap legislation.
- Five percent of all children who were TAFDC family cap children also participated in WIC, 5.3% in Food Stamps, and 2.0% in Early Intervention programs (data not shown).

Figure 3: Food security and food sufficiency

Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

- When asked if they had enough food in the previous 12 months, most of the GN Program participants (77.9%) reported that they had enough food and the kind of food they wanted.
- Approximately twelve percent (11.6%) reported that they had enough food but not the kinds they wanted, and 10.4% reported sometimes or often times not having enough food to eat.

Table 8: Maternal status and birthweight of Massachusetts GN Program participants

Massachusetts Growth and Nutrition Program, FY 2003

	Total N	Cases N	Percent
Birthweight⁵	249		
VLBW < 1500 g		19	7.6
MLBW 1500 - < 2500 g		47	18.9
Normal 2500 - 4000 g		174	69.9
HBW > 4000 g		9	3.6
Gestational Age	274		
Premature < 37 weeks		56	20.4
Full Term ≥ 37 weeks		218	79.6
Mother's Age at Child's Birth	252		
< 20 y		23	9.1
20 – 29 y		133	52.8
≥ 30 y		96	38.1
Trimester in which Prenatal Care Began	251		
No Prenatal Care		3	1.2
First Trimester		227	90.4
Second Trimester		15	6.0
Third Trimester		6	2.4
Parity	271		
1 – 2 children		211	77.9
3 – 4 children		54	19.9
> 4 children		6	2.2

Source: Massachusetts Department of Public Health, 2003

- Twenty-seven percent (26.5) of the participants enrolled in the Growth and Nutrition Program in FY 2003 were born with low birthweight, of which 7.6% were very low birthweight (<1500 g) and 18.9% were moderately low birthweight (1500 g - <2500 g).
- Nearly seventy percent (69.9%) of the new cases were born with normal birthweight (2500 – 4000 g) and 2.8% were high birthweight babies (>4000 g).
- One-fifth (20.4%) of participants were born prematurely (< 37 weeks gestational age).
- The majority of the mothers of GN children were between 20 and 29 years of age at the time of child's birth, 9.1% were younger than 20 years of age and 38.1% were 30 years or older at the time of child's birth. Most mothers (90.4%) began prenatal care during the first trimester, followed by 6.0% in the second and 2.4% in the third trimester. One percent (1.2%) of women reported not having any prenatal care.

⁵ VLBW, very low birthweight; MLBW, moderately low birthweight; NBW, normal birthweight; HBW, high birthweight

Growth and Nutritional Status at Intake

The determination of undernutrition commonly is based on a child's weight-for-age or height-for-age falling below the 5th percentile relative to a population-based growth reference. In cases where the majority of a population falls at the extremes of the percentiles (such as the high risk population represented in the GN Program), however, the 3rd percentile is recommended as the cutoff. The revised CDC Growth Charts include the 3rd and 97th percentiles to facilitate plotting of children at extremes of distributions such as the children participating in the GN Programs (Kuczmarski et al., 2003).

Low weight-for-age (underweight) may represent both inadequate linear growth as well as poor body tissue stores, and is an indicator of acute undernutrition. Weight-for-age is a composite of height-for-age and weight-for-height and does not distinguish children who are tall and thin from short-well proportioned children. Low height-for-age (stunting) is a measure of long term undernutrition, and usually is associated with chronic adverse conditions. Low weight-for-height is considered an indicator of acute undernutrition (thinness or wasting) and is generally associated with failure to gain weight or a loss of weight (Kuczmarski et al., 2003). The proportion of children with poor nutritional status can be expressed as percentiles or as standard deviations (z-scores; see Technical Foreword). The 5th and 3rd percentiles are equivalent to -1.645 and -1.88 z-scores, respectively. In addition to nutritional causes, children's decreased growth may be due to genetic short stature. From birth until about two years a child's weight changes to follow the genetic predisposition of the parents' height and weight (Bassali et al., 2003). These children are considered as normal even when they are below the third percentile on the growth chart.

Results are presented by pre-term and full-term status because the nutritional status of pre-term children, most of whom are MLBW⁶ and VLBW, is different from that of full-term children. Including the pre- and full-term children in the same analysis would underestimate the proportion of children who were undernourished.

Children can exhibit growth delay in any one or a combination of the nutritional status indicators (WA, HA and WH). Therefore, results are presented for WA, HA, and WH separately, and the same child could be represented in more than one category depending on the nature of their growth delay. In addition, an "overall" category is presented that represents the absolute number and percentage of children with growth and nutrition status delays; that is, a child is counted only once in the "overall" category, regardless of whether the child is deficient in only one or several of the WA, HA, and WH indicators.

⁶ MLBW, birthweight < 2500 g and > 1500 g; VLBW, birthweight < 1500 g.

Table 9: Proportion of children below the 3rd percentile in weight-for-age, height-for-age, and weight-for-height at intake

Massachusetts Growth and Nutrition Program, FY 2003

Nutritional status indicator	< 3 rd Percentile					
	Pre-Term babies*			Full-Term babies		
	Total N	Cases N	Percent	Total N	Cases N	Percent
Weight-for-age (WA)	56	53	94.6	214	159	74.3
Height-for-age (HA)	52	25	48.1	208	45	21.6
Weight-for-height (WH)	53	32	60.4	211	98	46.4
Overall poor nutritional status	56	56	100.0	216	173	80.1

Source: Massachusetts Department of Public Health, 2003

* Gestational age < 37 weeks

- In general, a greater proportion of the pre-term children had poor nutritional status relative to full-term children. Overall, all (100%) of pre-term children were below the 3rd percentile in at least one of the nutritional status categories. Individually, 94.6% were below the 3rd percentile for weight-for-age, 48.1% were below the 3rd percentile for height-for-age, and 60.4% were below the 3rd percentile for weight-for-height.
- In comparison, 80.1% of full-term children were malnourished (below the 3rd percentile in WA, HA or WH). Nearly three-quarters (74.3%) were below the 3rd percentile in weight-for-age. In addition, 21.6% were below the 3rd percentile for height-for-age, and 46.4% were below the 3rd percentile for weight-for-height.

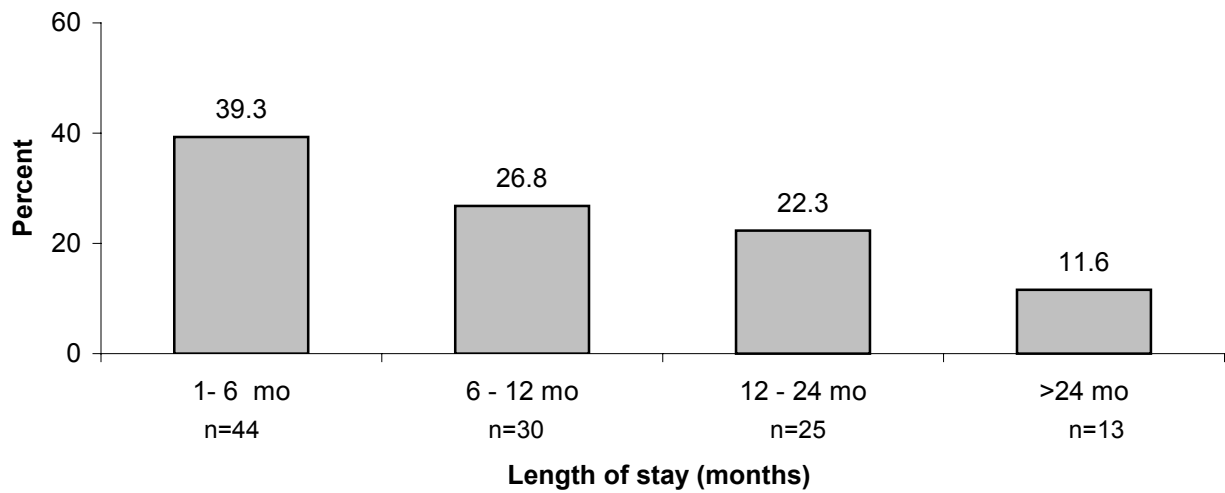
Table 10: Proportion of babies greater than or equal to 3rd percentile in weight-for-age, height-for-age, and weight-for-height at intake
Massachusetts Growth and Nutrition Program, FY 2003

Nutritional Status	≥ 3 rd Percentile					
	Pre-Term babies*			Full-Term babies		
	Total N	Cases N	Percent	Total N	Cases N	Percent
Weight-for-age (WA)	56	3	5.4	214	55	25.7
Height-for-age (HA)	52	27	51.9	208	163	78.4
Weight-for-height (WH)	53	21	39.6	211	113	53.6

Source: Massachusetts Department of Public Health, 2003
* Gestational age < 37 weeks

- The majority (78.4%) of full-term cases who were enrolled in the GN Program during FY 2003 had normal height-for-age, compared with 51.9% among pre-term children. This indicates that the growth failure among full-term children is of a more acute than chronic nature.
- It is likely that the greater prevalence of low height-for-age among pre-term children is coupled with low weight-for-age, and indicates that they were small for gestational age, and have not experienced much catch-up growth. In addition, children who are small for gestational age often are delayed in both growth in weight as well as height, which is indicated by normal weight-for-height.
- The large proportion of full-term children who exhibited normal weight-for-height (53.6%) indicates that for over half of the sample, although they may have both acute wasting and linear growth failure, their body tissue stores are proportional to their length.

Figure 4: Average length of stay in the Massachusetts GN Program
 Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

- Almost two-thirds (66.1%) of children were enrolled in the GN Program for one year or less. Of these, 39.3% stayed in the program for 6 or less months, and 26.8% for 6 to 12 months.
- About one-third (33.1%) of children continued to receive treatment at the GN sites for one year or longer, of which 22.3% were in the program between 12 and 24 months and 11.6% were in the program more than two years.
- The average length of stay in the Massachusetts GN Program was 12.4 months (data not shown).

Table 11: Average length of stay in the Massachusetts GN Program by nutritional status at intake and birthweight

Massachusetts Growth and Nutrition Program, FY 2003

	Total N	Cases N	Average Stay in GN Program (mo)
Weight-for-age	112		
< 3 rd Percentile		81	13.9 †
≥ 3 rd Percentile		31	8.4
Height-for-age	108		
< 3 rd Percentile		35	11.7
≥ 3 rd Percentile		73	12.4
Weight-for-height	111		
< 3 rd Percentile		45	14.4
≥ 3 rd Percentile		66	10.5
Overall Nutritional Status*	112		
< 3 rd Percentile		92	14.0
≥ 3 rd Percentile		20	6.8
Birthweight	96		
< 2500 g (LBW)		24	10.4
≥ 2500 g (NBW)		72	13.4

Source: Massachusetts Department of Public Health, 2003

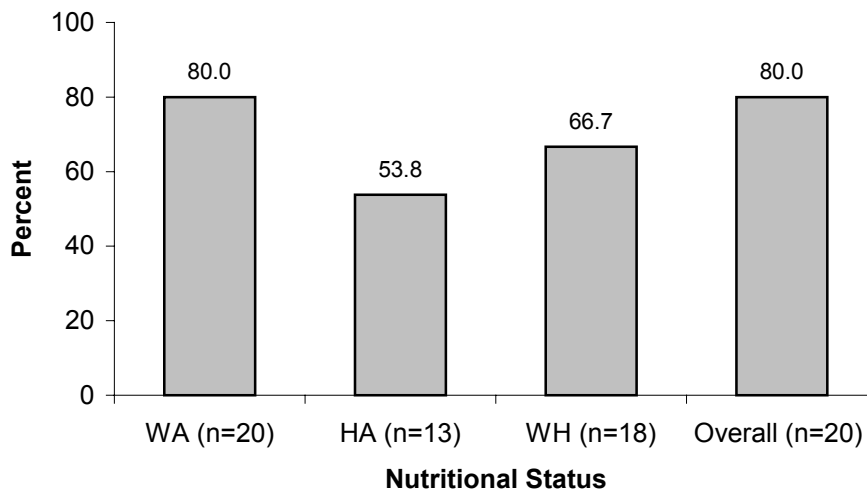
† Significantly different at P < 0.05.

* Weight-for-age, height-for-age, or weight-for-height < 3rd percentile.

- As expected, children who came into the GN sites with poor nutritional status generally took a longer time to be discharged than those who were not severely malnourished. The average length of enrollment in the GN Program was significantly greater in children with weight-for-age < 3rd percentile than in children ≥ 3rd percentile (13.9 vs. 8.4 months) (P < 0.05).
- There was no significant difference in average length of the stay in the GN Programs between children who were < 3rd percentile and ≥ 3rd percentile in height-for-age, 11.7 vs. 12.4 months. A similar pattern was observed for weight-for-height, where the average length of stay in the GN Program was 14.4 months for children < 3rd percentile and 10.5 months for the children with weight-for-height ≥ 3rd percentile. We were unable to find significant differences in length of stay between children who were below the 3rd percentile and those above the 3rd percentile in height for-age and weight-for-height z-scores because of inadequate sample size.
- The largest mean difference in length of stay in the GN Program was observed among children with low weight-for-age compared with children with low height-for-age or weight-for-height, (13.9 vs. 8.4 months) (P < 0.05).
- The differences in length of stay in the program by nutritional and birthweight status were not significant in this report due to the limited sample size. Our previous report, with a larger sample size, clearly showed that children with poor nutritional status took longer to be discharged from the GN Program than normal children.

Figure 5: Improvement in nutritional status among pre-term babies who were enrolled in the Massachusetts GN Program

Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

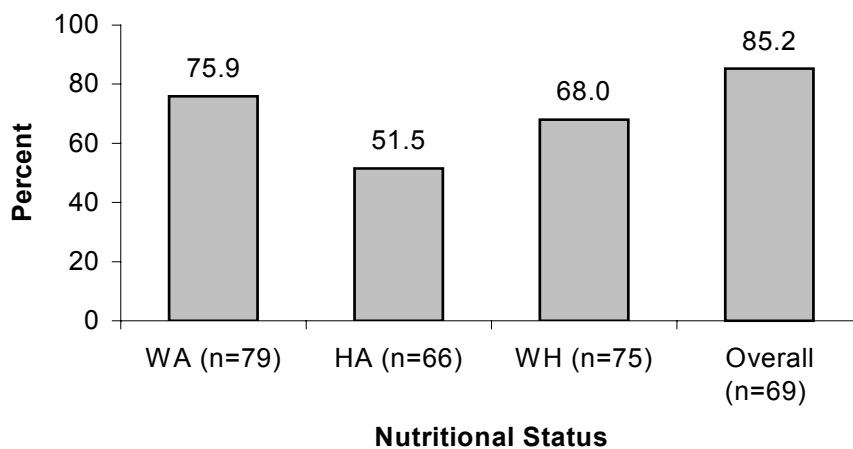
The analyses for Figures 5 and 6 required a comparison of growth z-scores at intake and discharge. We did not have an adequate sample size in these analyses to present results by duration in the GN Program to account for the difference between children who were in the program for more than one year versus those who only stayed in the program for a few months before achieving appropriate weight or height for their age.

Weight-for-age (WA), height-for-age (HA), and weight-for-height (WH) z-scores were computed and each measure at intake was subtracted from the respective measure at discharge. Results are presented for each of the individual indicators of nutritional status (WA, HA, WH). In addition, children with a positive difference in z-score in any one of those three categories were counted as having demonstrated overall improvement in growth problems, relative to the total number of participants ("overall").

- Among pre-term babies completing a course of treatment at the GN Programs, 80% showed improvement in weight-for-age, 53.8% in height-for-age and 66.7% in weight-for-height.
- Overall, 80% of pre-term children showed improvement in weight-for-age, height-for-age or weight-for-height by the time of discharge.

Figure 6: Improvement in nutritional status among full-term babies who were enrolled in the Massachusetts GN Program

Massachusetts Growth and Nutrition Program, FY 2003



Source: Massachusetts Department of Public Health, 2003

- Among full-term babies completing a course of treatment, 75.9% showed improvement in weight-for-age, 51.5% in height-for-age, and 68.0% in weight-for-height.
- Overall, 85.2% of the full-term children showed improvement in at least one of the nutritional status indicators by the time of discharge.

Table 12: Hematological status at intake among children aged 6 months or greater
Massachusetts Growth and Nutrition Program, FY 2003

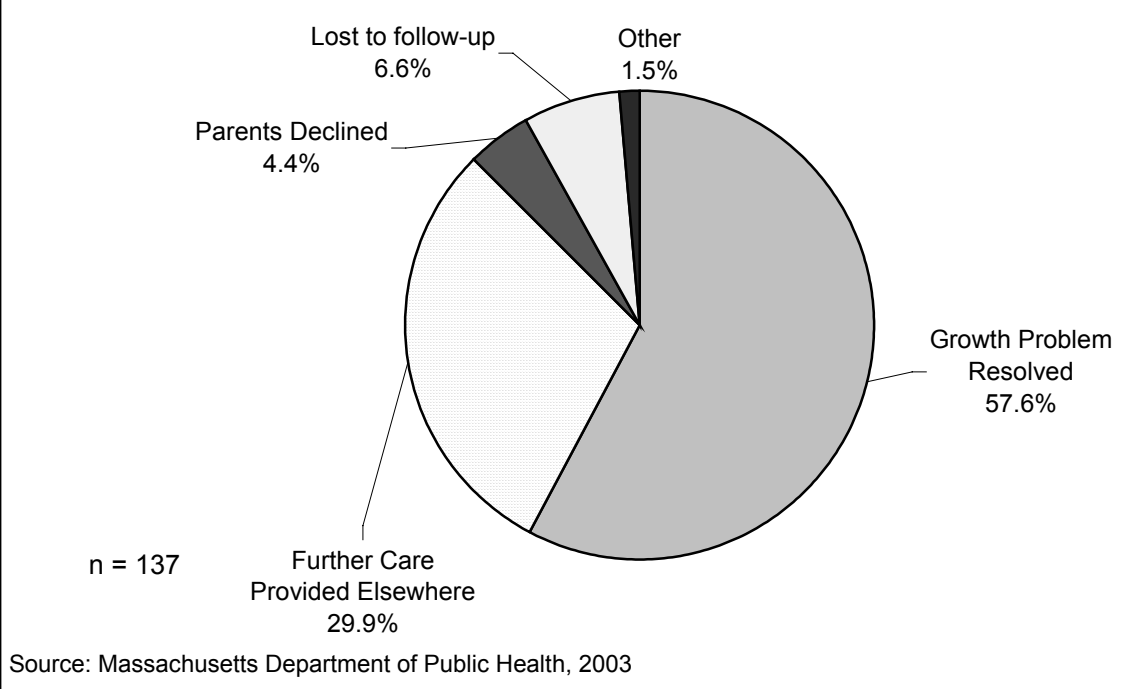
	Total N	Cases N	Percent
Hemoglobin Status	191		
Low		37	19.4
Normal		154	80.6
Hematocrit Concentration	190		
Low		58	30.5
Normal		132	69.5
Blood Lead	139		
<=10 µg/dl (Normal)		132	95.0
>10 µg/dl (High)		7	5.0

Source: Massachusetts Department of Public Health, 2003

- Almost a fifth (19.4%) of the new cases older than 6 months had evidence of having anemia based on low hemoglobin concentration.
- Thirty-one percent (30.5%) had evidence of having anemia based on low hematocrit concentration.
- Five percent (5.0%) of the new cases had high lead levels (>10 µg/dL).

PART 3: Characteristics of Subjects at Discharge

Figure 7: Primary reason for discharge from the Growth and Nutrition Program
Massachusetts Growth and Nutrition Program FY 2003



- The major reason for discharge from the GN Program was that the growth problems were resolved (57.6%). Other reasons for discharge included the provision of further treatment elsewhere (29.9%), and parental refusal to continue with the program (4.4%).
- Seven percent (6.6%) of the cases were lost to follow-up.

Table 13: Leading organic* factors contributing to children's growth problems
Massachusetts Growth and Nutrition Program, FY 2003

Organic Factors	Total N	Cases N	Percent
Inadequate energy intake ⁷	137	124	90.5
Prematurity/Low Birthweight	137	26	19.0
Iron deficiency anemia	137	25	18.2
GI disorder	137	25	18.2
Chronic respiratory infection	137	19	13.9
Recurrent otitis media	137	16	11.7
Oral-motor dysfunction	137	15	10.9
Reactive airway disease	137	12	8.8
Cardiac problems	137	10	7.3
Respiratory obstruction	137	8	5.8
Neuromuscular disorder	137	8	5.8
Dental problems	137	7	5.1
Congenital anomalies	137	6	4.4

Source: Massachusetts Department of Public Health, 2003

* Organic factors: where physical or biochemical disease are cause for growth failure

Table 13 presents the percentage of children whose growth was reported to be affected by the organic factors. Note that these categories are not mutually exclusive.

- The most common organic factors reported to contribute to growth delays included inadequate energy intake (90.5%), prematurity/low birthweight (19.0%), iron deficiency anemia (18.2%), gastrointestinal disorders (18.2%), chronic respiratory infections (13.9%), recurrent otitis media (11.7%), oral motor dysfunction (10.9%), and reactive airway disease (8.8%).

⁷ "Inadequate energy intake" in this context is referring to organic difficulties with energy absorption or utilization, often in association with some of the other organic problems listed, and not with inadequacies of intake associated with economic or psychosocial aspects of inadequate intake, such as food insufficiency or caregiver feeding interaction problems.

Table 14: Non-organic factors contributing to children's growth problems
Massachusetts Growth and Nutrition Program, FY 2003

Non-Organic Factors*	Total N	Cases N	Percent
Meal patterns/schedule	137	112	81.8
Nutrition information deficit	137	108	78.8
Reliance on liquids	137	78	56.9
Family stressors	137	72	52.6
Child's temperament	137	66	48.2
Parent's temperament	137	61	44.5
Poor feeding interactions	137	40	29.2
Parental health practice	137	34	24.8
Food shortages	137	23	16.8
Poor non-feeding interactions	137	15	10.9

Source: Massachusetts Department of Public Health, 2003

* Non-organic: where problems in child's social environment result in the growth failure.

Table 14 presents non-organic (social or environmental) factors that GN staff reported as having contributed to a child's growth problem. The categories are not mutually exclusive.

- Eighty-two percent (81.8%) of the growth problems were due to meal patterns or schedules.
- Parental misperceptions and/or lack of information about feeding and development were reported in 78.8% of the cases.
- Fifty-seven percent (56.9%) of growth problems were due to parent's reliance on feeding the child liquid foods.
- Family stressors (including loss of a family member, poverty, and marital discord) were associated with lack of child's growth in 52.6% of the children.
- Forty-eight percent (48.2%) of growth problems resulted from child temperament (including a sickly or difficult child, irritability and apathy).
- Forty-five percent (44.5%) of growth problems were associated with parent's temperament (including an isolated or overwhelmed mother or an emotionally uninvolved father).
- GN staff reported that 29.2% of children's growth problems were due to poor feeding interactions.

Table 15: Number of hospitalizations, clinic and home visits
Massachusetts Growth and Nutrition Program, FY 2003

	Total N	Cases N	Percent
Number of hospitalizations	137		
0		127	92.7
1 – 2		8	5.8
≥ 3		2	1.5
Number of clinic visits	124		
1 – 3		41	33.1
4 – 6		32	25.8
> 6		51	41.1
Number of home visits	137		
0		75	54.7
1 – 3		35	25.5
4 – 6		13	9.5
> 6		14	10.3

Source: Massachusetts Department of Public Health, 2003

Note that number of hospitalizations and clinic visits included visits for both growth problems and other illnesses.

- The majority (92.7%) of the cases completing a course of treatment at GN Programs reported having no hospitalizations, indicating that GN Programs were able to treat most of the cases through outpatient services and not through hospitalizations.
- Thirty-three percent (33.1%) of the respondents reported having 1 to 3 clinic visits during their stay in the GN Program, 25.8% had 4 to 6 clinic visits and 41.1% reported visiting the clinic more than six times during their stay in the GN Program.
- The majority of cases (54.7%) reported that they did not receive any home visit during their stay in the GN Program, 25.5% received 1 to 3 home visits, 9.5% received 4 to 6 home visits and 10.2% reported receiving more than 6 home visits.
- It is likely that the percentage of children receiving home visits is underestimated. Data regarding services received during the entire period of enrollment are collected only at the time of discharge, and it is very possible that services received during the early period of enrollment are inadvertently omitted when the form is filled out later; sometimes a significant period of time has elapsed since the service was provided.

Table 16: Referrals and participation in community-based services
Massachusetts Growth and Nutrition Program, FY 2003

	Referral to Services			Participation in Services	
	Total N	Cases N	Percent	Cases N	Percent
WIC	137	29	21.2	83	60.6
Medicaid	137	2	1.5	70	51.1
Food Stamps	137	2	1.5	43	31.4
AFDC	137	3	2.2	39	28.5
Early Intervention	137	25	18.2	35	25.5
SSI	137	7	5.1	19	13.9
DSS	137	3	2.2	13	9.5
Other Services	137	19	13.9	10	7.3
Head Start	137	5	3.6	7	5.1
Community Nursing	137	2	1.5	5	3.6

Source: Massachusetts Department of Public Health, 2003

At discharge, families were asked which of the above services they were currently receiving and if the GN staff facilitated their involvement in those services.

- The most common referrals were to WIC (21.2%) and to Early Intervention (18.2%)
- Other common referrals to community-based service participation included SSI (5.1%), Head Start (3.6%) and DSS (2.2%).
- Over half (60.6%) of the respondents reported that they participated in WIC at the time of discharge from the GN Program compared to 53% at intake (Table 8).
- Other services in which many families participated included: Medicaid (51.1%) Food Stamps (31.4%), AFDC (28.5%), Early Intervention (25.5%), SSI (13.9%) and DSS (9.5%).

Table 17: Proportion of homeless and foster care children at intake and discharge
Massachusetts Growth and Nutrition Program, FY 2003

	At intake		
	Total N	Cases N	Percent
Child homeless in past year	276	19	6.9
Child currently homeless	279	11	3.9
Child in foster care in the past year	281	12	4.3
Child currently in foster care	280	10	3.6
	At discharge		
	Total N	Cases N	Percent
Child currently homeless	137	4	2.9
Child homeless during treatment	137	11	8.0
Child currently in foster care	137	4	2.9
Child in foster care at any time during treatment	137	5	3.6

Source: Massachusetts Department of Public Health, 2003

- Four percent (4.3%) of children enrolling in the GN Program were in foster care compared to 2.9% who reported being in foster care at the time of discharge, and 5.3% who reported being in foster care at some point during treatment in the GN Program.
- At the time of enrollment, 6.9% of participants reported being homeless during the previous year, and 3.9% reported being currently homeless.
- At the time of discharge, 8.0% of participants reported being homeless during course of their treatment in the GN Program, and 2.9% reported being currently homeless.

CONCLUSIONS

The Massachusetts GN Program was established to evaluate and treat children with growth problems. Analysis of the FY 2003 data examined demographic characteristics, participation in community-based services and nutritional status of the children at the time of enrollment into the GN Program. The report also looked at the effect of the GN Program on children's improvement in nutritional status between intake and discharge from the GN Program. In addition, referrals and participation in community-based services, causes of GD, and proportion of homeless or foster care children at time of discharge from the program were described.

Receipt of community-based services

The staff at GN Programs interact with many families that are eligible for other programs, such as the WIC, Food Stamp, Early Intervention and Head Start Programs, that promote the health and nutrition status of participants. Many GN sites have had long-standing relationships with these programs and not only receive GN referrals from the programs but also coordinate services for co-served clients in order to reinforce care plan strategies for the improvement in nutritional status. For instance, the majority of children participating in the GN Program also received WIC (53.0%), Early Intervention (30.4%), and Food Stamps (25.7%) at intake. Outreach and referral coordination with these programs may facilitate GN children receiving Early Intervention and Head Start if not already enrolled at intake. Other common referrals to community-based service participation included Supplemental Security Income (SSI) (5.1%) and Head Start (3.6%).

Nutritional status at intake

The GN Program uses anthropometric indices as measures of nutritional status. Weight and height data for cases were compared to national age and gender specific reference data for indications of undernutrition. Most of the children who were enrolled in the GN Program were acutely malnourished based on their anthropometric indices at intake. In addition, twenty to thirty percent of the children also showed evidence of iron deficiency based on hemoglobin and hematocrit concentrations. Although GD is caused by organic, non-organic and mixed factors, the majority of children's growth delays stemmed from mainly inorganic or social, economic and environmental factors. The prevalence of social and environmental factors related to the growth and nutrition problems of the children reveals the importance of a family-centered multidisciplinary approach that relies on the contributions of all GN team members. By assessing and addressing non-organic factors associated with GD, the programs were able to intervene and address underlying social and environmental causes of a child's growth and nutrition problem. Home visits were part of the treatment plan for most GN Program participants, to help identify underlying causes of the growth delay that could not be determined during a clinic visit or to support and reinforce the implementation of care plan strategies in the home setting.

Improvement in nutritional status between enrollment and discharge

Children who have experienced GD due to acute or chronic undernutrition can achieve catch up growth if a sustained improvement in their nutritional status occurs, particularly if intervention occurs at a young age (Golden, 1994; Martorell et al., 1994). Following treatment at GN sites, almost all children (80.0% among full-term and 85.2% among pre-

term children) showed evidence of overall improvement in nutritional status (weight-for-age, height-for-age or weight-for-height). A greater proportion of children showed improvement in weight than in height. However, a greater proportion of children had low weight-for-age than low height-for-age at the time of enrollment in the GN Program. The greater impact on improvement in weight-for-age is consistent with research suggesting that undernutrition of short duration would impact weight before it would affect height (Waterlow, 1994). Children who were below the 3rd percentile in any of the anthropometric indices at intake showed improvement in that particular index at discharge. In general, a greater proportion of full-term children showed improvement in nutritional status between intake and discharge than pre-term children. However, the small sample size of the pre-term children could have affected the results. In our previous report with a larger sample size we found that pre-term children showed a greater improvement in nutritional status than full-term children.

Hematological Assessment

In the previous report (Metallinos-Katsaras et al., 1997), the development of consistent policies to screen for anemia and high blood lead levels and the conduct of more in-depth assessments of iron status for those with low hemoglobin or hematocrit were recommended. The present report continues to provide more complete hematological data with fewer missing data than in the previous report, indicating that the recommendations were adopted.

RECOMMENDATIONS

Based on the results presented in this report, the following recommendations are made:

- Continue outreach efforts and improve referrals to community-based agencies which provide additional services to GN Program clients.
- Continue to highlight the growth and nutritional status of premature/LBW babies separately from full term, normal weight babies since premature children exhibit differences in nutritional status and growth performance compared to full-term babies.
- Add supplemental questions, such as those included in the Current Population Survey Food Security Supplement questionnaire, about food availability during the preceding 12 months. This would allow for comparisons to other statewide and national reports regarding food sufficiency and security.
- Consider collecting incremental data to allow for calculation of growth velocity and timing of improvement in growth. This recommendation could be accomplished best by capturing encounter-level data through a computerized data collection system. It is recommended that a needs assessment regarding system development and site-level computer capacity be initiated. Computerized data collection and transmission also would improve data quality and timeliness.

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Appendix 1

**Table 18: List of Massachusetts Growth and Nutrition Program
Participating Sites, FY 2003**

Site Name	Location
Boston Medical Center	Boston
New England Medical Center	Boston
St. Anne's Hospital	Fall River
Brockton Hospital	Brockton
Baystate Medical Center	Springfield
Children's Hospital	Boston
UMass Medical Center	Worcester
Greater Lawrence Family Health Center	Lawrence
Saints Memorial Hospital Medical Center	Lowell

Source: Massachusetts Department of Public Health, 2003

Appendix 2

Calculation of Poverty Status

A poverty status variable was created by combining household income and household size and adjusting them according to the federal poverty guidelines. Family income was originally collected as a categorical variable. To define income in relation to the federal poverty level, the midpoints of the income range in each category was used. For instance, a response coded within the range of \$5,000 to \$9,999 would be converted to percentage poverty on the basis of \$7,500. Table 19 presents federal poverty guidelines for FY 2003. One consideration is that guidelines are based on the calendar year while the family income of GN patients is available only on a fiscal year basis.

Table 19: Federal Poverty Guidelines for the 48 Contiguous States*

Household Size	Annual Income in US dollars	
	FY 2003	
1	8,860	
2	11,940	
3	15,020	
4	18,100	
5	21,180	
6	24,260	
7	27,340	
8	30,420	
Additional Person**	2,620	

Source: Federal Register, 2003.

* Separate Federal poverty guidelines were provided for the 48 Contiguous States, Alaska and Hawaii. The table above includes data for the 48 Contiguous States only.

** For each additional person add the amount shown.

Appendix 3:

Growth and Nutrition Program Intake and Discharge data collection forms

**MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
GROWTH & NUTRITION PROGRAM
INTAKE FORM**

CONFIDENTIAL INFORMATION. PLEASE PRINT. REFER TO MANUAL FOR INSTRUCTIONS.

1. **PATIENT STATUS:** 1 = New patient 2 = Reactivation 3 = Transfer

CLINIC AND REFERRAL INFORMATION

2. **DATE OF FIRST CLINIC, HOME, OR HOSPITAL CONTACT:** ...
Month Day Year

3. **INITIAL REFERRAL SOURCE:**
01 = Hospital inpatient 05 = Private primary care 09 = VNA
02 = Outpatient subspecialty 06 = Community health center 10 = WIC 13 = Other _____
03 = Emergency Room 07 = Other MDPH GN Program 11 = Early Intervention 99 = Unknown
04 = Hospital-based primary care 08 = Dept Social Services 12 = Self-referral

4. **PROGRAM SITE:**
01 = BMC 03 = Fall River 05 = Baystate 07 = UMass 09 = Lawrence
02 = NEMC 04 = Brockton 06 = Children's 08 = South Cove 10 = Saints Memorial

PATIENT INFORMATION

5. **GROWTH & NUTRITION IDENTIFIER:**

6. **IF CHILD IS TRANSFERING FROM ANOTHER MDPH GNP**
LIST THE IDENTIFIER USED BY THE LAST PROGRAM:

7. **CHILD'S SEX:** (M = Male F = Female).....

8. **CHILD'S DATE OF BIRTH:**
Month Day Year

9. **CITY/TOWN WHERE CHILD LIVES:** [If City = Boston, write in name of Boston Neighborhood]

City/Town City/Town Code (leave blank)

10. **ETHNIC BACKGROUND OF CHILD (IF MIXED, RECORD MOTHER'S ETHNICITY):** .
01 = Puerto Rican 09 = Haitian 17 = Middle Eastern
02 = Dominican 10 = Other West Indian (incl Jamaican) 18 = European
03 = Central American (incl Mexican) 11 = Chinese 19 = American Indian
04 = Other Hispanic (incl Cuban) 12 = Cambodian 20 = North American
05 = S. American 13 = Vietnamese 21 = African American
06 = Brazilian 14 = Laotian (incl Hmong) 22 = African
07 = Cape Verdean 15 = Other Asian (incl Pacific Islander) 88 = Other _____
08 = Other Portuguese 16 = Pakistani/Asian Indian 99 = Unknown

11. **RACE OF CHILD (IF MIXED, RECORD MOTHER'S RACE):**
1 = White 4 = American Indian
2 = Black 5 = Other (Specify, _____)
3 = Asian 9 = Unknown

GN ID

12. DATE OF HEIGHT AND WEIGHT MEASUREMENTS:
Month D ay Year

13. CHILD'S HEIGHT/LENGTH:
CHECK ONE: ☐ Height ☐ Length OR
Inches Fourths Centimeters

14. CHILD'S WEIGHT: OR
Pounds Ounces Kilograms

15. HAS A DECELERATION OF ANY DURATION OCCURRED IN WEIGHT FOR AGE?
1 = Yes 2 = No 9 = Unknown
IN WEIGHT FOR HEIGHT?.....
IN HEIGHT FOR AGE?.....

16. RECENT HEMATOLOGY (within 6 months of intake):
HCT % HGB gms/100 ml Date of HCT/HGB
Month D ay Year
Pb (Lead) ug/dl Date of Pb (Lead)
Month D ay Year

17. ACTION PLAN (Select one category)
1 = Clinic will actively follow the child
OR Clinic will not be following the child because: (choose most applicable response below)
2 = Primary care physician will provide further care for the growth problem
3 = Other specialty clinic (e.g. renal, HIV, cardiac, etc.) will provide further care
4 = Multidisciplinary GN services not needed (e.g., not FTT, constitutional short stature)
5 = Parents declined or refused further treatment or evaluation by this clinic
6 = Other: _____

18. IF NO FURTHER TREATMENT OR EVALUATION IS NEEDED, DID THE CLINIC REFER THE FAMILY TO ANY OF THE FOLLOWING NUTRITION SERVICES? 1 = Yes 2 = No 9 = Unknown
☐ WIC ☐ Food Stamps ☐ Head Start ☐ Food Pantry ☐ Other
(specify _____)

**STOP HERE IF CHILD WILL NOT RECEIVE FURTHER TREATMENT/EVALUATION
IN GROWTH AND NUTRITION CLINIC**

PREGNANCY AND BIRTH DATA

19. **WAS THIS A MULTIPLE GESTATION?** (1 = Yes 2 = No 9 = Unknown)
20. **CHILD'S BIRTHWEIGHT:** Pounds OR Grams
(enter 99 99 if unknown)
21. **CHILD'S BIRTH LENGTH:** Inches OR Centimeters
(enter 999 if unknown)
22. **GESTATIONAL AGE OF CHILD (IN WEEKS):** (enter weeks completed, 99 = Unknown)
23. **BIRTH ORDER OF CHILD:** (01 = First child, etc., 99 = Unknown):
24. **NO. OF LIVE BIRTHS TO BIOLOGICAL MOTHER AT TIME OF INTAKE** (99 = Unknown)
25. **TRIMESTER OF PREGNANCY IN WHICH PRENATAL CARE BEGAN FOR THIS CHILD:**
0 = No prenatal care 2 = Month 4-6 (second trimester) 9 = Unknown
1 = Month 1-3 (first trimester) 3 = Month 7-9 (third trimester)

HEALTH INSURANCE AND PROGRAM PARTICIPATION

26. **WHICH TYPE OF HEALTH INSURANCE COVERAGE DOES THIS CHILD HAVE?**
(enter up to 2 insurers)
1 = Blue Cross/Blue Shield 4 = Medicaid/Mass Health 8 = Other (specify _____)
2 = Health Maintenance Org (HMO) 5 = CommonHealth 9 = Unknown
(includes BCBS HMO, NHP) 6 = Other Gov't (CHAMPUS) 0 = None (uninsured, self-pay)
3 = Other Commercial Insurance 7 = Children's Medical Security Plan
27. **DOES THIS CHILD'S HOUSEHOLD PARTICIPATE IN OR RECEIVE SERVICES FROM ANY OF THESE PROGRAMS?** 1 = Yes 2 = No 9 = Unknown [Enter one response for each box]
- | | | |
|--|---|--|
| A. TAFDC <input type="text"/> | F. DSS (all services) <input type="text"/> | K. Homemaker/Home health care <input type="text"/> |
| B. SSI <input type="text"/> | G. Head Start <input type="text"/> | L. Community Nursing/VNA <input type="text"/> |
| C. WIC <input type="text"/> | H. First Steps <input type="text"/> | M. Adolescent Parenting Program <input type="text"/> |
| D. Food Stamps <input type="text"/> | I. Healthy Families <input type="text"/> | N. Other Services: <input type="text"/> |
| E. Early Intervention <input type="text"/> | J. Employment Training <input type="text"/> | - specify _____ |

28. **WAS THIS CHILD A TAFDC FAMILY CAP CHILD?**
1 = Yes 2 = No 9 = Unknown

FAMILY INFORMATION

29. **ESTIMATE THE HOUSEHOLD INCOME IN THE PREVIOUS TWELVE MONTHS:**
01 = \$ 0- 4,999 04 = 15,000-19,999 07 = 40,000-49,999
02 = 5,000- 9,999 05 = 20,000-29,999 08 = 50,000 or more
03 = 10,000-14,999 06 = 30,000-39,999 99 = Unknown
30. **WHICH STATEMENT BEST DESCRIBES THE FOOD EATEN IN THIS CHILD'S HOUSEHOLD IN THE LAST 12 MONTHS?**
1 = Enough and the kinds of food wanted 3 = Sometimes not enough 9 = Refused
2 = Enough but not always the kinds of food wanted 4 = Often not enough

--	--	--	--	--	--

31. COMPOSITION OF CHILD'S HOUSEHOLD:**A. Indicate who lives with the child:** 1 = Yes 2 = No 9 = Unknown

1. Child's biological mother
2. Child's biological father
3. Child's foster parent(s)
4. Child's step parent or other adult care taker
5. Other adult

(Specify relationship: _____)

B. Total number of individuals \geq 18 years [99 = Unknown]

--	--

C. Total number of individuals < 18 years (including child) [99 = Unknown]

--	--

32. LOCATION WHERE CHILD SPENDS MOST TIME DURING THE WEEK BETWEEN 8AM - 5PM:

- | | | | |
|-------------------------------------|---------------------|-------------------------------------|-------------|
| 1 = At home with primary care taker | 3 = Day care center | 5 = Educational program (preschool) | 9 = Unknown |
| 2 = At home with relative | 4 = Family day care | 6 = Other _____ | |

--

33. NUMBER OF SMOKERS IN THE HOUSEHOLD: (cigarette, cigar, pipe, etc.)

[99 = Unknown]

--	--

34. BIOLOGICAL MOTHER'S COMPLETED YEARS OF EDUCATION:

- | | | |
|---------------------------|------------------------------|--------------------------------|
| 1 = Less than high school | 3 = Finished high school/GED | 5 = Four years college or more |
| 2 = Some high school | 4 = Some college | 9 = Unknown |

--

35. BIOLOGICAL FATHER'S COMPLETED YEARS OF EDUCATION:

- | | | |
|---------------------------|------------------------------|--------------------------------|
| 1 = Less than high school | 3 = Finished high school/GED | 5 = Four years college or more |
| 2 = Some high school | 4 = Some college | 9 = Unknown |

--

36. MOTHER'S OR FEMALE GUARDIAN'S CURRENT EMPLOYMENT STATUS:

- | | | |
|---|------------------------------------|---|
| 01 = Full-time, Outside Home | 04 = Part-time (in or out of home) | 08 = Not working due to disability |
| 02 = Full-time, in the Home
(except homemaker) | 05 = Parental leave | 09 = Other _____ |
| 03 = Full-time Homemaker | 06 = Unemployed | 10 = Not present and not supporting child |
| | 07 = Student (not employed) | 99 = Unknown |

--	--

37. FATHER'S OR MALE GUARDIAN'S CURRENT EMPLOYMENT STATUS:

- | | | |
|---|------------------------------------|---|
| 01 = Full-time, Outside Home | 04 = Part-time (in or out of home) | 08 = Not working due to disability |
| 02 = Full-time, in the Home
(except homemaker) | 05 = Parental leave | 09 = Other _____ |
| 03 = Full-time Homemaker | 06 = Unemployed | 10 = Not present and not supporting child |
| | 07 = Student (not employed) | 99 = Unknown |

--	--

38. BIOLOGICAL MOTHER'S DATE OF BIRTH:

Month		Day		Year	

39. HAS THIS CHILD BEEN HOMELESS IN THE PAST YEAR?(i.e. living in a shelter, hotel, "doubled-up", or lacking shelter)
1 = Yes 2 = No 9 = Unknown

--

40. IS THIS CHILD CURRENTLY HOMELESS?

1 = Yes 2 = No 9 = Unknown

--

41. HAS THIS CHILD BEEN IN FOSTER CARE IN THE PAST YEAR?

1 = Yes 2 = No 9 = Unknown

--

42. IS THIS CHILD CURRENTLY IN FOSTER CARE?

1 = Yes 2 = No 9 = Unknown

--

**MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
GROWTH & NUTRITION PROGRAM
DISCHARGE/TRANSFER FORM**

CONFIDENTIAL INFORMATION. PLEASE PRINT. REFER TO MANUAL FOR INSTRUCTIONS.

PROGRAM INFORMATION

1. **DATE OF LAST VISIT/CONTACT:**
Month Day Year
2. **PROGRAM SITE:**
- 01 = BMC 03 = Fall River 05 = Baystate 07 = UMass 09 = Lawrence
02 = NEMC 04 = Brockton 06 = Children's 08 = South Cove 10 = Saints Memorial

PATIENT INFORMATION

3. **GROWTH & NUTRITION IDENTIFIER:**
4. **CHILD'S SEX:** (M = Male F = Female)
5. **CHILD'S DATE OF BIRTH:**
Month Day Year

MEASUREMENTS

6. **DATE OF HEIGHT AND WEIGHT MEASUREMENTS:**
Month Day Year
7. **CHILD'S HEIGHT/LENGTH:**
CHECK ONE: Height Length OR
Inches Fourths Centimeters
8. **CHILD'S WEIGHT:** OR
Pounds Ounces Kilograms
9. **RECENT HEMATOLOGY (within 6 months of discharge):**

HCT

HGB

%

Date of HCT/HGB

gms/100 ml
Month Day Year

Pb (Lead)

ug/dl

Date of Pb (Lead)

Month Day Year

--	--	--	--	--	--

DISCHARGE/TRANSFER STATUS

10. **THIS CHILD IS BEING:** ☐

1 = Discharged from Growth and Nutrition Clinic

2 = Transferred to another MDPH GN Program, specify clinic: _____

11. **WHAT IS THE *PRIMARY* REASON FOR DISCHARGE (choose the most applicable response):** ☐

1 = Growth problem resolved, no further action needed by multidisciplinary team

2 = Evaluation completed, no growth problem substantiated or child has constitutional short stature

3 = Further care for or monitoring of the growth problem to be provided elsewhere (e.g., primary care, specialty clinic)

4 = Parents declined or refused further treatment (transportation problems, etc.)

5 = Family moved

6 = Patient had multiple changes in health insurance and will not return to clinic

7 = Lost to follow-up

8 = Other _____

CASE HISTORY

12. **WHICH OF THE FOLLOWING CONTRIBUTED TO THE CHILD'S GROWTH PROBLEM?**

1 = Yes 2 = No 8 = Not Applicable 9 = Unknown

[Enter a response for each category]

A. NONORGANIC FACTORS

1. Child's temperament

☐

2. Parent's temperament

☐

3. Nutrition information deficit.....

☐

4. Parental health practices

☐

5. Meal patterns/schedule

☐

6. Over reliance on liquids

☐

7. Poor/dysfunctional feeding interactions

☐

8. Poor/dysfunctional non-feeding interactions

☐

9. Family stresses

☐

10. Food shortage

☐

B. ORGANIC FACTORS

1. Cardiac problems

☐

2. Congenital anomalies

☐

3. Genetic syndromes

☐

4. Neuromuscular disorder

☐

5. Oral-motor dysfunction

☐

6. Metabolic/endocrine disorders

☐

7. In utero cocaine exposure

☐

8. Other in utero drug exposure ...

☐

9. GI disorder:

☐

- specify _____

10. Fetal alcohol syndrome

☐

11. Prematurity/LBW/IUGR

☐

12. Iron deficiency anemia

☐

13. Non-nutritional anemia (eg; sickle cell)

☐

14. Lead poisoning

☐

15. Recurrent Otitis media

☐

16. Chronic respiratory infections (eg; colds)

☐

17. Reactive airway disease (eg; asthma, BPD)

☐

18. Respiratory obstruction (eg; enlgd adenoids)

☐

19. Dental problems

☐

C. OTHER: _____

☐

13. ARE YOU AWARE OF A 51A EVER FILED FOR PHYSICAL ABUSE/NEGLECT OR SEXUAL ABUSE OF THIS CHILD? (1 = Yes 2 = No 9 = Unknown) **WAS IT SUBSTANTIATED?** (8 = NA)

[Enter a response for each category]

A. Physical Abuse or Neglect	Filed <input type="text"/>	Substantiated <input type="text"/>
B. Sexual Abuse	Filed <input type="text"/>	Substantiated <input type="text"/>

14. AFTER INTAKE, NUMBER OF HOSPITALIZATIONS TO TREAT

GROWTH PROBLEMS:
 99 = Unknown

15. NUMBER OF HOME VISITS MADE BY CLINIC TEAM (Begin with INTAKE):
 99 = Unknown

16. NUMBER OF VISITS TO CLINIC (Begin with INTAKE):
 99 = Unknown

17. WHICH OF THESE SERVICES IS THE FAMILY CURRENTLY RECEIVING:
 (ENTER RESPONSE IN BOX A)

DID THE GN CLINIC STAFF FACILITATE INVOLVEMENT IN THESE SERVICES DURING THE CHILD'S TREATMENT: (ENTER RESPONSE IN BOX B)

1 = Yes 2 = No 9 = Unknown (ENTER ONE RESPONSE FOR EACH BOX)

A. TAFDC	<input type="text"/>	<input type="text"/>	I. Healthy Families	<input type="text"/>	<input type="text"/>
B. SSI	<input type="text"/>	<input type="text"/>	J. Employment Training	<input type="text"/>	<input type="text"/>
C. WIC	<input type="text"/>	<input type="text"/>	K. Homemaker/Home Health Care	<input type="text"/>	<input type="text"/>
D. Food Stamps	<input type="text"/>	<input type="text"/>	L. Community Nursing/VNA	<input type="text"/>	<input type="text"/>
E. Early Intervention	<input type="text"/>	<input type="text"/>	M. Medicaid	<input type="text"/>	<input type="text"/>
F. DSS (all services)	<input type="text"/>	<input type="text"/>	N. Adolescent Parenting Program	<input type="text"/>	<input type="text"/>
G. Head Start	<input type="text"/>	<input type="text"/>	O. Other Services:	<input type="text"/>	<input type="text"/>
H. First Steps	<input type="text"/>	<input type="text"/>	-specify	<input type="text"/>	<input type="text"/>

18. IS THIS CHILD CURRENTLY HOMELESS?
 (i.e. living in a shelter, hotel, "doubled-up", or lacking shelter)
 1 = Yes 2 = No 9 = Unknown

19. WAS THIS CHILD HOMELESS AT ANY TIME DURING TREATMENT?
 1 = Yes 2 = No 9 = Unknown

20. IS THIS CHILD CURRENTLY IN FOSTER CARE?
 1 = Yes 2 = No 9 = Unknown

21. WAS THIS CHILD IN FOSTER CARE AT ANY TIME DURING TREATMENT?
 1 = Yes 2 = No 9 = Unknown